Space Weather Forecast

Issued on Monday, 03 October 2022 at 13:23 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1/G2 Minor-Moderate storms likely on Day 1 and Day 2. Ongoing likelihood of Moderate flares with chance of Strong flares due to two notable sunspot groups.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Strong over the last 24 hours, with a both a Strong and several Moderate flares observed. There are eight numbered regions on the disk, with a region in the northwest and a large complex region in the northeast the most likely source of any further flares. The other regions are small and simple.

In the last 24 hours, two potentially Earth-directed CMEs (coronal mass ejections) have been observed leaving the Sun, due to the observed flares. The strong flare sourced CME has been analysed to miss Earth, with the Moderate flare one likely missing but with a chance of a glancing arrival on the 4th. These CMEs may combine with those already en-route that were observed leaving the Sun on the 1st.

Solar Wind / Geomagnetic Activity: Solar wind speeds have been at slightly-elevated to elevated levels due to Earth being affected by faster winds from a coronal hole. The magnetic field strength was mostly weak but climbed to moderate levels at 03/1000 UTC. The north-south component has mostly been weak. The resultant geomagnetic activity was mainly Quiet to Unsettled (Kp 0-3), but rose to G1/Minor Storm (Kp5) at 03/2100-2359 UTC.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is currently just above normal background levels and easing in response to the recent Strong flare, but well below the S1/Minor Storm threshold.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is forecast to be Moderate to High, with flares likely from the large region in the northeast and the region in the northwest.

Solar Wind / Geomagnetic Activity: There are potentially four CMEs which could influence Earth, all from near the sunspot group in the northwest. The first, which left the Sun on the 1st, will potentially arrive late on day 1 (3rd) or early day 2 (4th), although this is low confidence with a glancing impact most likely. Further CMEs follow, however these are even lower confidence for arrival, but may combine with the first arrival to give further enhancement through day 2 (4th). The uncertainty around these CMEs gives very low confidence in the forecast. Otherwise current fast winds are expected to only gradually ease day 3 and day 4 (5th and 6th), becoming mainly slightly elevated by the end of the period. Geomagnetic activity is forecast to be mainly Unsettled to Active day 1 and day 2 (3rd-4th) with G1-G2 Minor to Moderate Storms likely, perhaps ongoing into day 3 (5th) with any CME arrival. Otherwise, a general trend back towards Quiet, with isolated Unsettled intervals is expected later day 3 and day 4 (5th-6th).

Energetic Particles / Solar Radiation: The count rate of energetic particles is expected to be near or at background but with a chance of rising at times due to any further flaring from the notable sunspots. This giving a slight chance of reaching the S1/Minor Storm threshold.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	60	60	20	5
Strong	G3	No	15	15	1	1
Severe	G4	No	2	2	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	80	80	70	70
Very Active	R3 to R5 X	Yes	30	30	25	25

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	20	20	15	15
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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